Electromagnetic Theory II: Homework 7

Due: 19 February 2021

1 Boundary conditions: electric fields

Two conducting spherical shells are concentric. The inner shell has radius a and free surface charge Q that is uniformly distributed. The outer shell has radius b and free charge surface $-Q$, also distributed uniformly. The region between the shells is filled with a linear dielectric with dielectric constant ϵ_r.

a) Determine the electric field everywhere.

b) Verify that the *electric field* boundary conditions are satisfied at each spherical shell.

2 Boundary conditions: magnetic field

An infinitely long hollow cylinder has radius R. The cylinder carries a unifi=orm surface current, in cylindrical coordinates,

$$\mathbf{K} = K\hat{\boldsymbol{\phi}}$$

where $K > 0$ is constant.

a) Determine the magnetic field at all locations.

b) Verify that the *magnetic field* boundary conditions are satisfied at the cylinder boundary.

3 Griffiths, *Introduction to Electrodynamics, 4ed*, 7.44a),b),c), page 346.